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US 4697699 A

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(54) A pallet and apparatus for making the same.

(57) A tubular member 42 is provided as a supporting foot 40. Several cuts 43, arranged crosswise to one another, are arranged at the points of a flat pallet top 35 and pallet runners 36, which the end surface of the tubular member 42 adjoins. The free ends of these cuts 43 lie on a line 41 corresponding to the internal contour of the tubular member 42. With segments 44 formed by the cuts 43 folded, an inner tubular member 45 is clampingly inserted into the tubular member 42 forming the supporting foot. The apparatus for making such pallets has a piercing die 1, with a shaft 2 for holding the inner tubular member 45 forming the pallet foot. Arranged on the end surface are several cutting edges 4 provided in star-shaped arrangement. The piercing die cuts the flat top and forces in the inner tubular member 45. A multidie machine is shown in Fig 8.

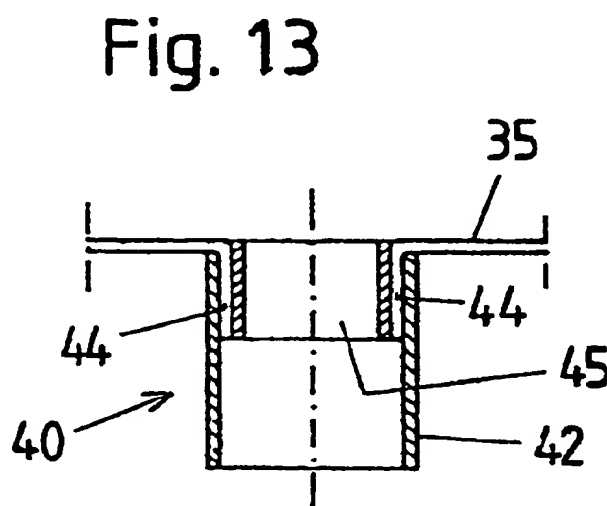
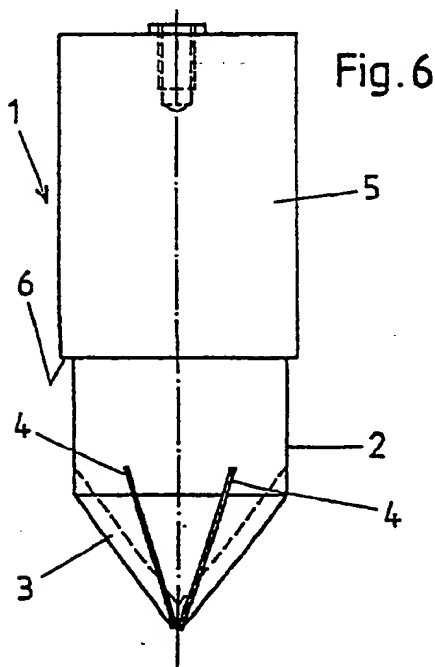


Fig. 1

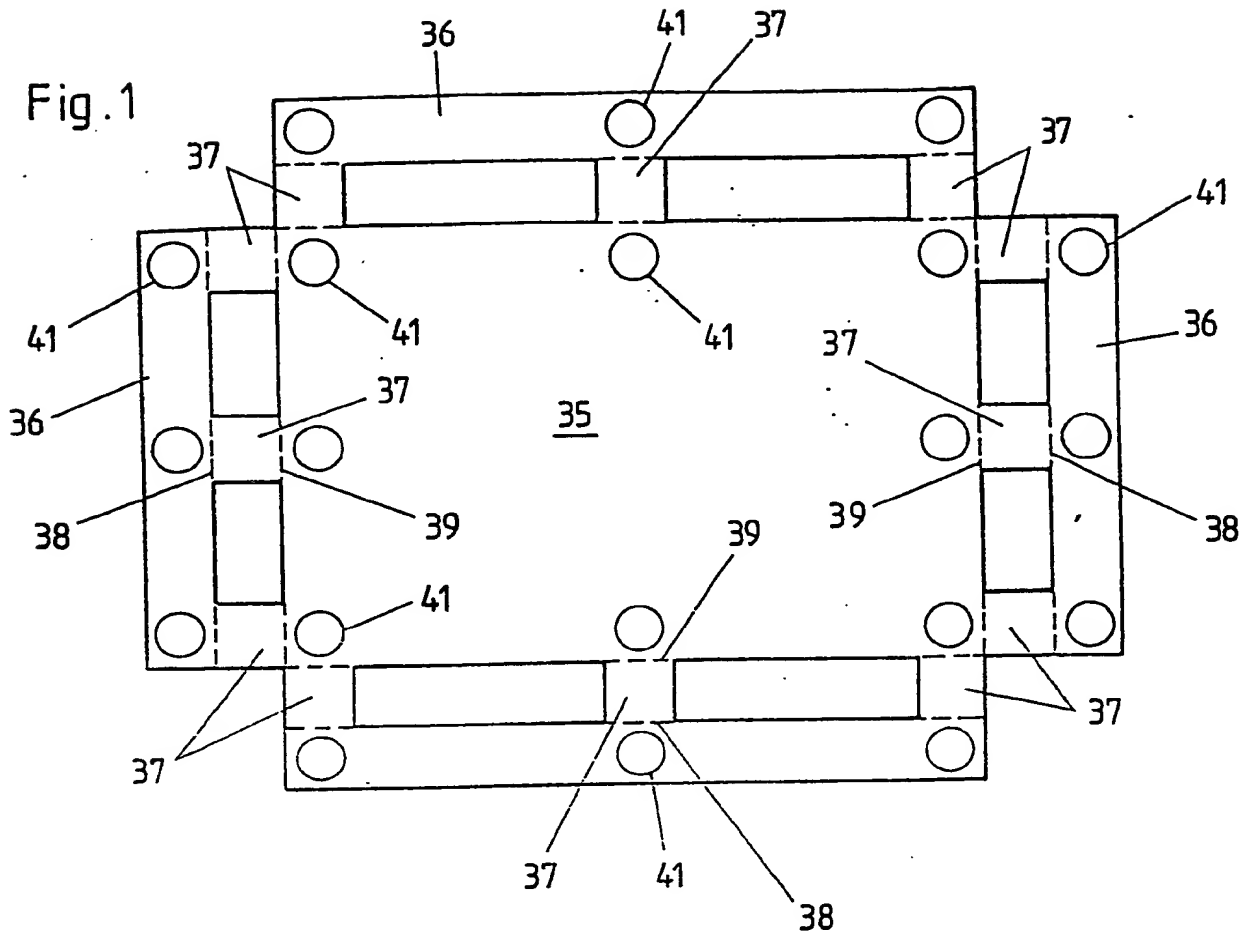


Fig. 5

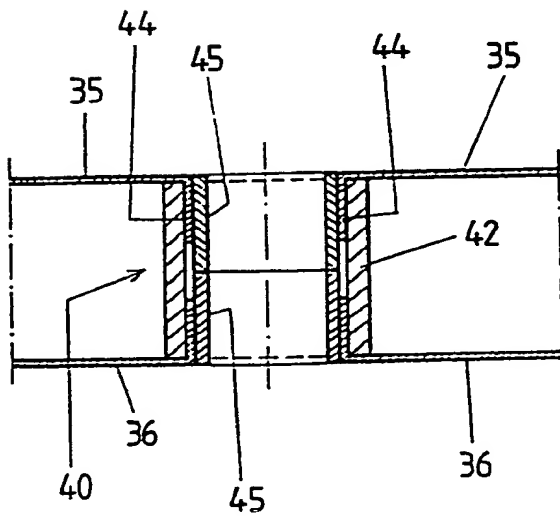


Fig. 4

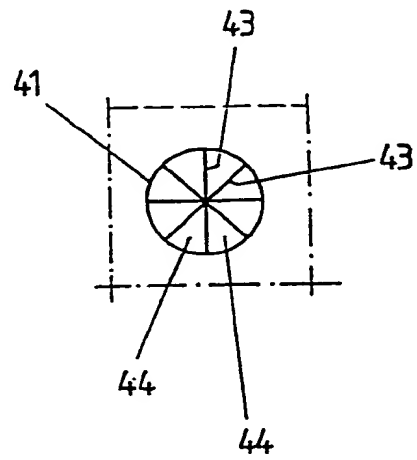


Fig. 2

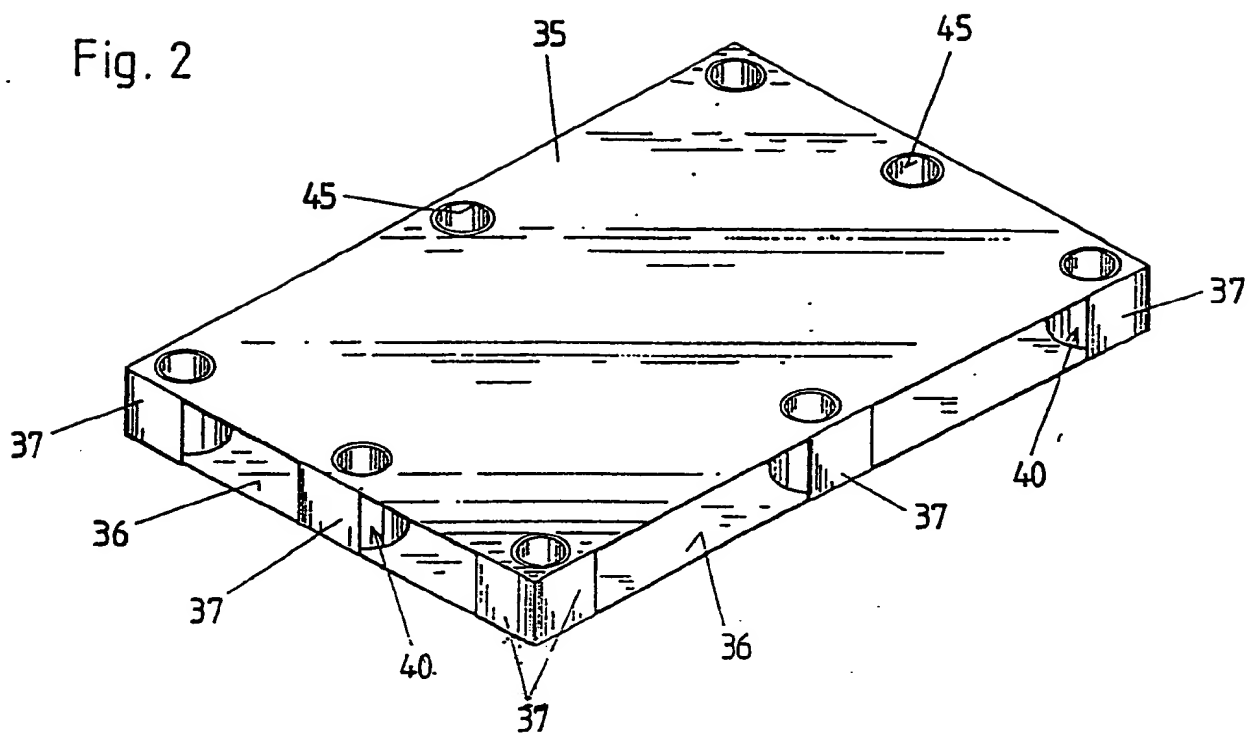


Fig. 3

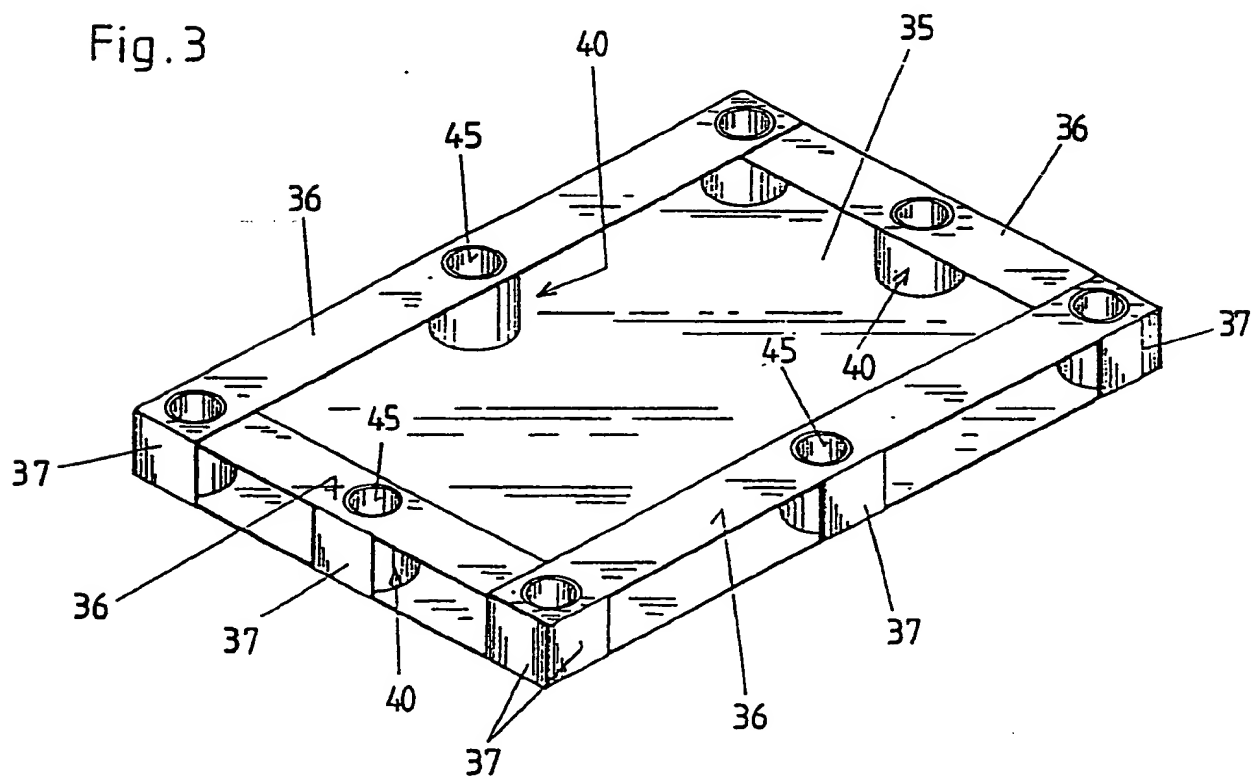


Fig. 13

Fig. 8

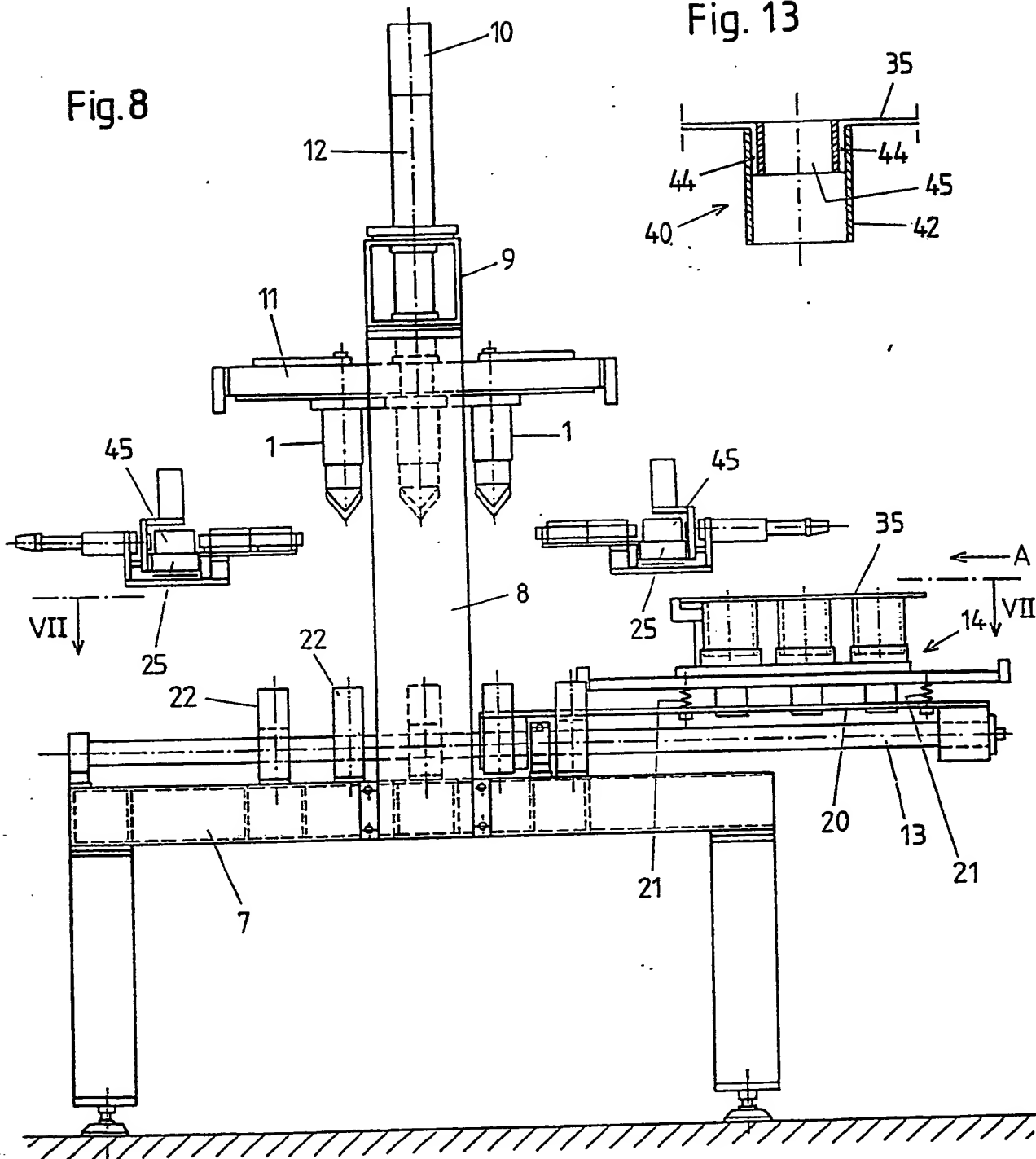


Fig. 10

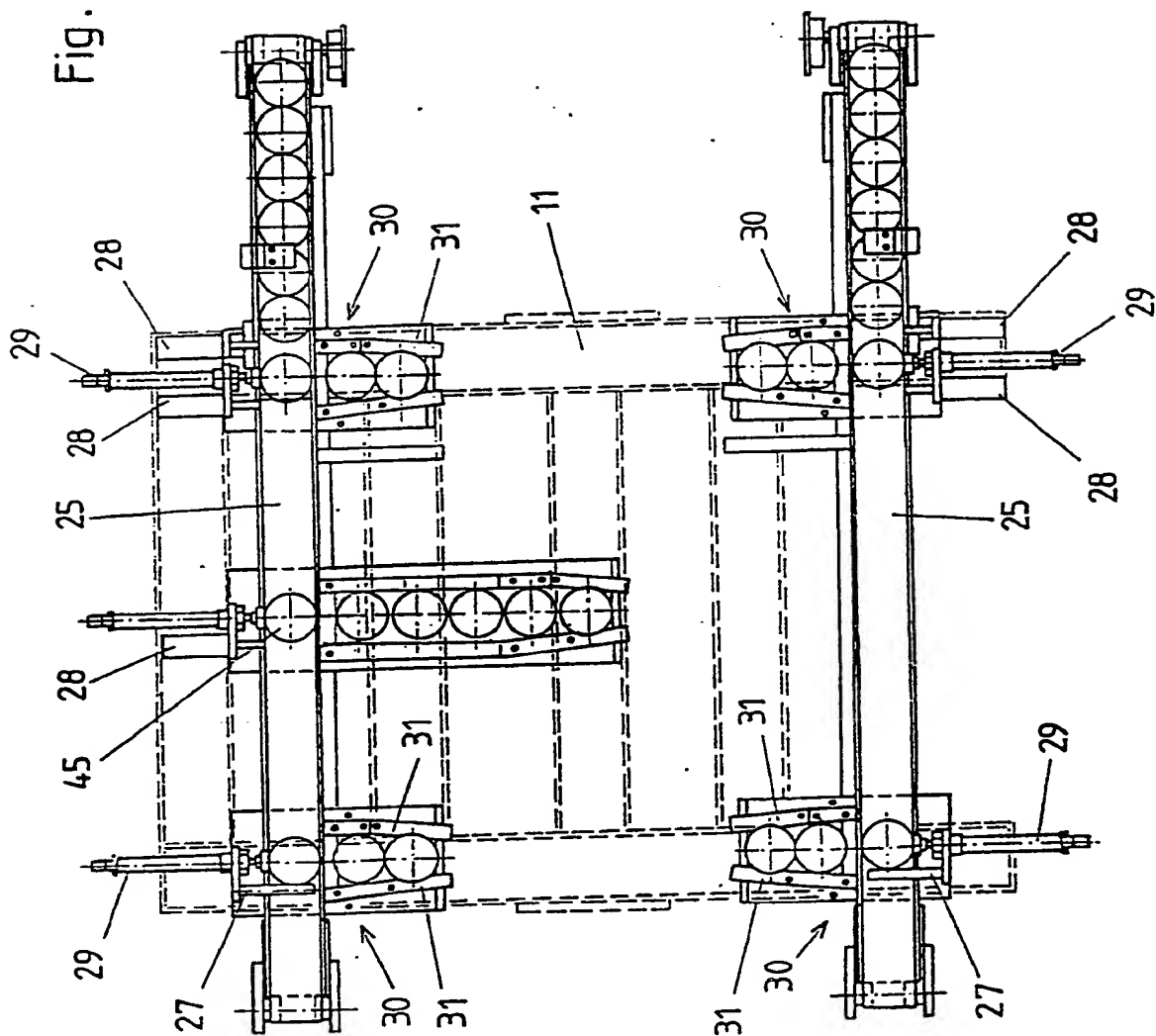


Fig. 11

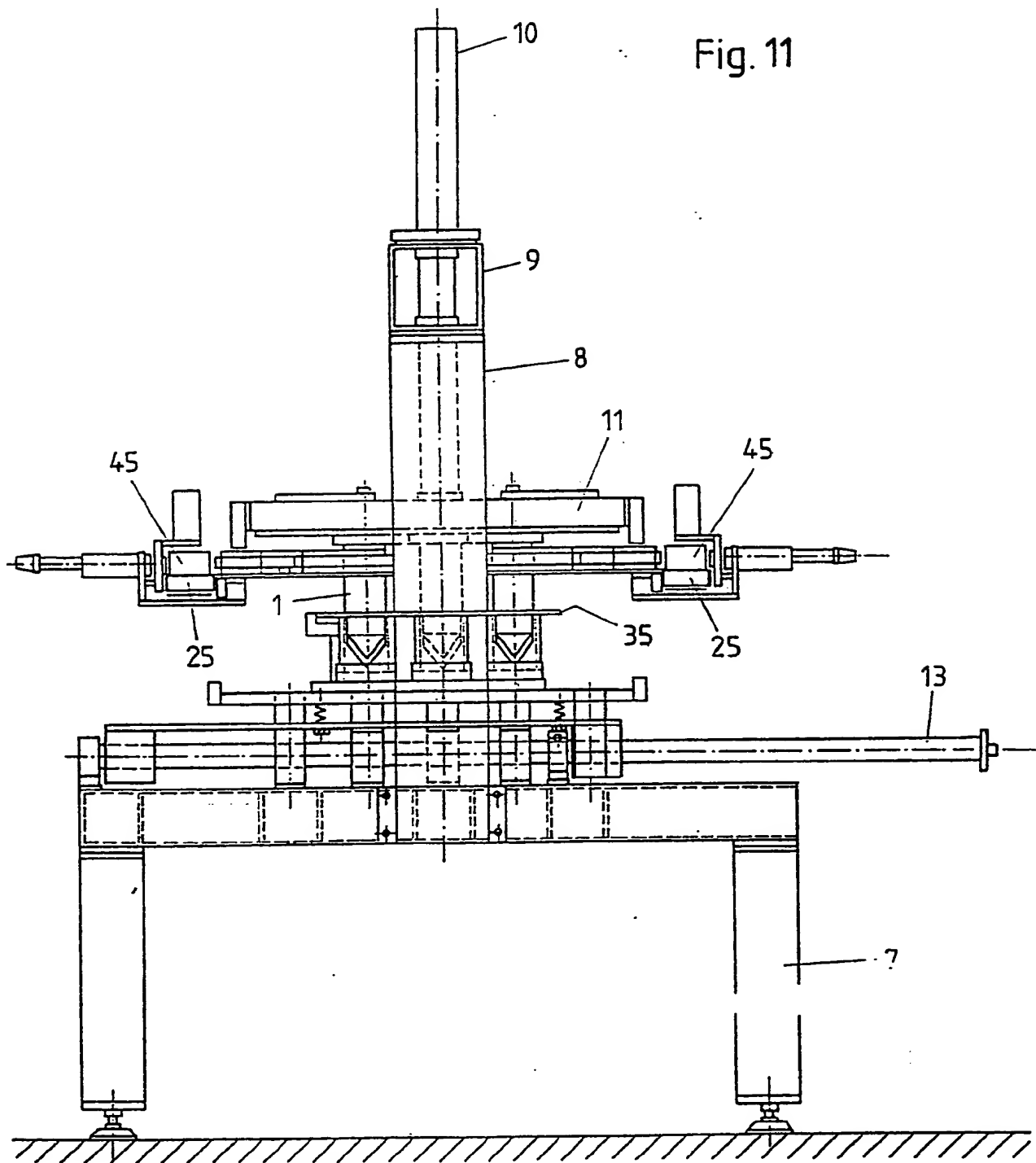


Fig. 7

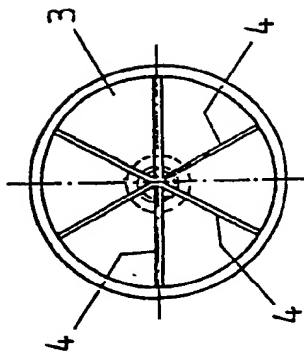


Fig. 6

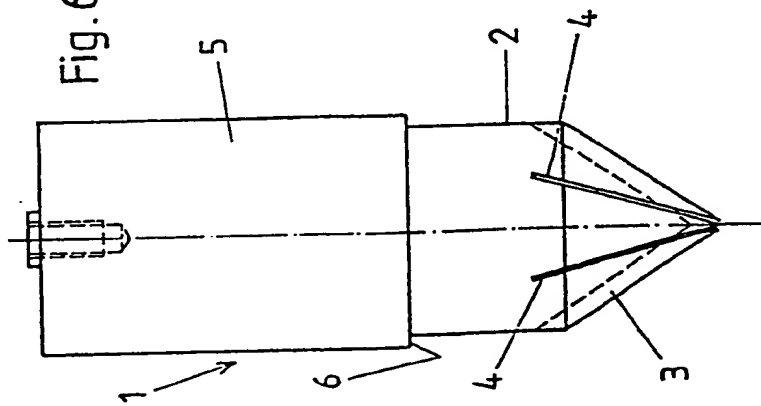
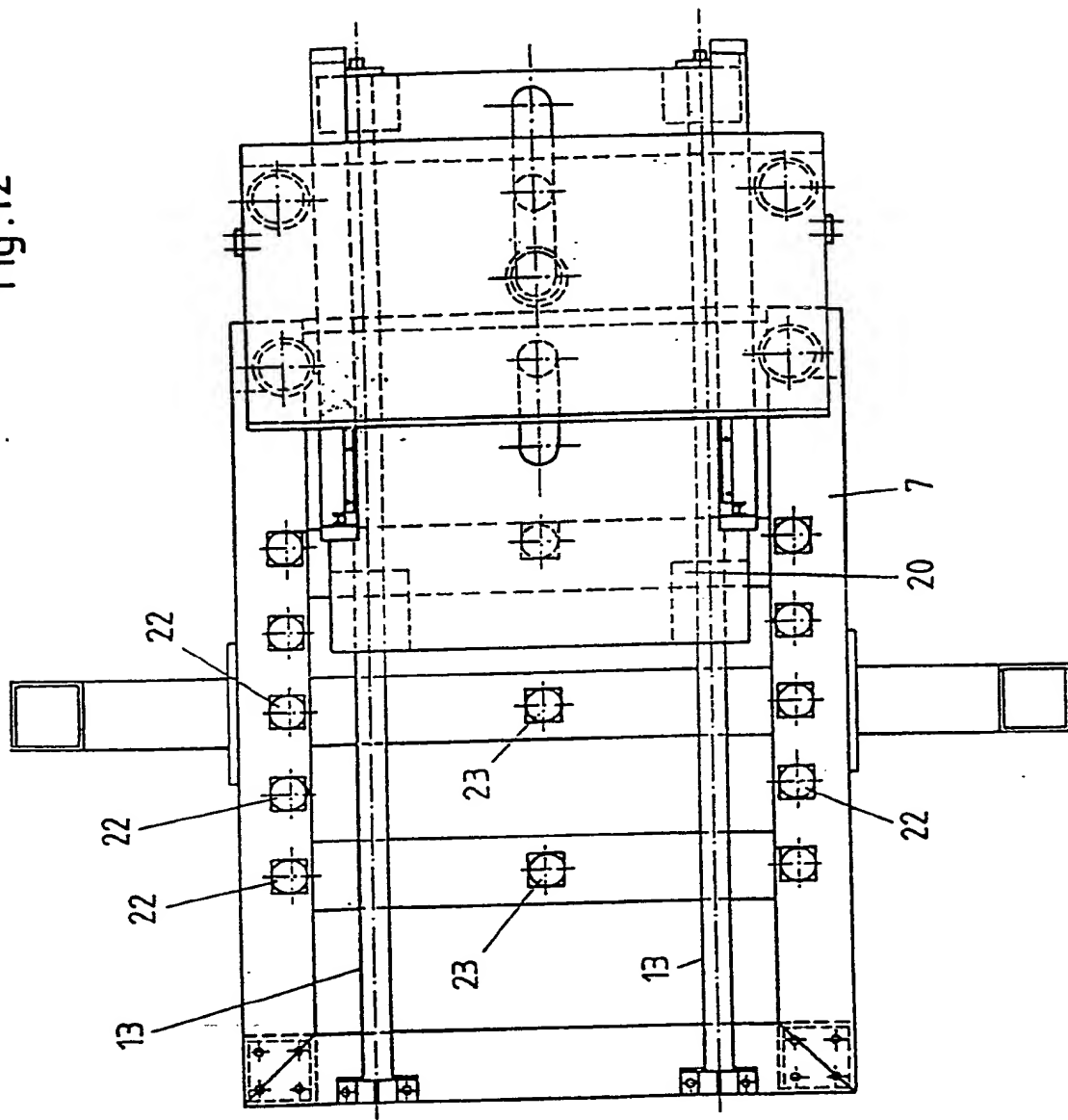


Fig. 12



A Pallet and Apparatus for Making the Same

The invention relates to a pallet with the features of the preamble of claim 1 and to apparatus for making such pallets.

The aim of the invention is to provide a particularly advantageous and simple solution for shaping the supporting foot and for its arrangement, which also involves low assembly costs, this being achieved according to the invention as a result of the features which form the content and subject of the characterising clause of claim 1. Advantageous developments of the invention are the subject of the sub-claims 2 to 7.

The invention also relates to apparatus for making such pallets, with which these pallets can be produced efficiently and at reasonable cost. This is achieved as a result of the measures which form the content and subject of the characterising clause of claim 8.

With apparatus of this kind, not only can the star-shaped cut be made and the inner tubular member be inserted into the outer tubular member in one procedure as it were, but in a further development of the apparatus according to the invention all the pallet feet

associated with a pallet top can also be fixed simultaneously. Expedient and advantageous developments of this apparatus form the subjects of the sub-claims 9 to 22.

In order to make the invention clear, it is explained in greater detail with reference to the drawing, without being restricted to the embodiments shown. In the drawings:

Fig. 1 shows the pallet opened out flat (pallet blank);

Fig. 2 shows the pallet ready for use in perspective seen from above;

Fig. 3 shows the same pallet as in Fig. 2 but seen from beneath;

Figs. 4 and 5 illustrate details on an enlarged scale relative to the other Figures;

Fig. 6 is a side view of the piercing die;

Fig. 7 is an end view of the die of Fig. 6;

Fig. 8 is a front view of apparatus according to the invention;

Fig. 9 is a side view of the apparatus of Fig. 8 viewed in the direction shown by arrow A in Fig. 8, the conveyors for supplying the inner tubular members having been omitted for the sake of clarity;

Fig. 10 is a plan view of the conveyors for supplying the inner tubular members;

Fig. 11 is a view of the apparatus shown in Fig. 8

but at a different point in its operation from Fig. 8;

Fig. 12 is a plan view of the machine table, partially in section along the sectional line VII-VII of Fig. 8; and

Fig. 13 is a detail section through a pallet foot fixed as prescribed with an outer and an inner tubular member.

The base material for making the pallet is in laminar form and preferably consists of corrugated cardboard. The pallet is produced from a flat blank, represented in plan view in Fig. 1. The central rectangular part of this single-piece blank forms the pallet top 35. Pallet runners 36 in the form of strips are provided along all four edges of the pallet top 35 and are joined thereto by means of bars 37. The dimensions (l and w) of the pallet top 35 are adapted to the particular requirements and may also comply with the relevant standard specifications (DIN 15146). The dot and dash lines 38 and 39 in Fig. 1 indicate the folding edges which run parallel to the longitudinal axis of the respective strip-like pallet runners 2 and at which the said parts (bars 37 and pallet runners 36) are folded over in order to prepare the pallet ready for use. The bars 37 are respectively folded over in the same direction in relation to the pallet top 35, as are the pallet runners 36 in relation to the bars 37, so that the bars 37 or their planes are at right angles to the

pallet top 35 and the pallet runners 36 lie parallel to the pallet top 35. This is shown in an oblique view in Fig. 2 in plan view and in Fig. 3 in a view from beneath.

Supporting feet 40 are provided to keep the pallet runners 36 spaced apart from the pallet top 35. When the pallet is fully folded and ready for use, the end surfaces of these supporting feet 40 are situated at the points marked and indicated in Fig. 1 by a thin circle 41.

In the embodiment shown, these supporting feet 40 are formed by respective tubular members 42 with a circular cross-section. At the points marked by the circles 41, several cuts 43 arranged crosswise to one another are now provided in the pallet top 35 or in the pallet runner 36 (see Fig. 4), the outer ends thereof lying on a line, in this case a circle 41 which corresponds to the interior contour of the tubular member 42. This line is preferably formed as an indented line or stamped line. Segments 44 which virtually constitute free-stamped lugs are obtained by these cuts 43.

To assemble the supporting feet 40, two tubular portions 45 are inserted into each tubular member 42 fitted between the pallet top 35 and the pallet runner 36, one tubular portion 45 being inserted into each end of the tubular member 42, the tubular portions 45 preferably being of equal length and their sum

corresponding to the height of the tubular member 42. They are inserted or pushed or pressed in, with the segments 44 obtained by the cuts 43 being folded over, the said segments now lying between these tubular portions and tubular members (see Fig. 5). The dimensions of the parts cooperating here are selected in such a way that the parts which enter into operative connection are clampingly held together. Applying adhesive here as well, if necessary, lies within the scope of the invention. The tubular portions 45 or the axial lengths thereof may also be rather larger in each case than half the length of the tubular member 42, and expediently they are larger by the thickness of the material which forms the pallet top or the pallet runner. This is also represented in Fig. 5. As a result these inserted tubular portions 45 are also able to take loads or to reinforce the supporting feet 40 as a whole.

Expediently, tubular members 42 and tubular portions 45 of circular cross-section are selected. However, it is possible to use tubular members and tubular portions with a cross-section which differs from this, for instance square cross-sections or elliptical cross-sections or a polygonal cross-section. According to current knowledge and experience, however, there is no advantage to be obtained with these over the tubular members with a circular cross-section, at least not as

far as the assembly of these parts is concerned. Polygonal supporting feet may possibly have a higher load-carrying capability over cylindrical supporting feet, assuming that they have the same wall thicknesses and are made of the same materials.

The pallet shown and described here as an embodiment has in addition to the pallet top 35 and the supporting feet 40 also pallet runners 36 which are joined to the pallet top 35 by way of the bars 37. Omitting these bars 37 and the pallet runners 36 lies within the scope of the invention, so that the pallet consists only of the pallet top 35 and the supporting feet 40.

The statements below refer only to the apparatus for making pallets consisting solely of the pallet top 35 and supporting feet 40. The piercing die 1 (see Figs. 6 and 7) consists of a first cylindrical portion 2, the diameter of which approximately corresponds to the internal diameter of the inner tubular member 45 of the pallet foot 40 (Fig. 13) and the conical end surface 3 of which bears several cutting edges 4 arranged in a star shape and lying on a hypothetical cone surface. The axial length of the cylindrical portion 2 approximately corresponds to the height of the inner tubular member 45, preferably it is somewhat longer than the said height. Connected upwardly to this cylindrical portion 2 is a further portion 5 whose diameter is larger than that of the portion 2, thereby forming a

bearing shoulder 6 for the tubular member 45 which is to be held by the portion 2.

The apparatus (see Figs. 8 and 9) has a fixed machine table 7, in the central region of which there is fixed a peripherally-closed, vertically upright frame 8 whose upper horizontal arm 9 bears a piston-cylinder-unit 10, to the piston of which there is secured a supporting frame 11, lying horizontally, with vertical guide rails 12 mounted so as to slide in corresponding bearings in the arm 9 of the frame 8. Secured to the underside of the supporting frame 11 which is vertically adjustable by means of the piston-cylinder-unit 10 are several piercing dies 1, the distribution and number of which correspond to the distribution and number of pallet feet 40 which are to be fixed to a pallet top 35.

Secured to the machine table 7, in this case, are two mutually parallel guide rails 13 which lie in a horizontal plane and on which support means 14 for a pallet top 35 is displaceable in the horizontal direction, this displacement causing the support means 14 to be moved into or outside the area of lift of the supporting frame 11 with the piercing dies 1.

This support means 14 has a plate 15 which is positioned horizontally and upon which cup-shaped positioning members 16 are fixed, these serving to receive the outer tubular members 42 of the pallet feet

40. Also secured to this plate 15 are uprights 18, pointing upwards, which serve as stops for the pallet top 35 which may be placed on top of the end surface of the tubular members 42. These stops lie in a horizontal plane in which the upper end surfaces of the outer tubular members 42 are also situated, these being inserted into the cup-shaped positioning members 16. Instead of cup-shaped positioning members 16, disc-shaped positioning elements could also be provided, or even pin-shaped positioning elements, i. e. all structural components and structural elements which are suitable for holding in the correct position the tubular member 42 to be received.

The plate 15, or a frame could equally be provided here, with the positioning members 16 is carried by a sliding carriage 20 mounted on the guide rails 13 and is elastically supported with respect to this sliding carriage 20 in the vertical direction by means of springs 21.

Arranged in vertical orientation in the central region of the machine table 7, on the edges thereof, are several block-shaped abutments 22, the height of which, measured from the machine table 7, is rather smaller than the distance of the underside of the plate 15 away from the machine table 7.

It is assumed that the pallet to be produced here bears a pallet foot 40 in each of its corner regions and

also a further pallet foot 40 is provided in the centre of the pallet top 35, thus altogether five pallet feet 40 should be attached.

Arranged in the vertical central plane of the machine table (Fig. 12), also in vertical orientation, are block-shaped abutments 23 but these are smaller in height than the abutments 22 provided on the edges. Abutments 24, also block-shaped, are arranged beneath the centrally lying positioning members 16 on the plate 15, the sum of the heights of these abutments 23 and 24 corresponding to that of the height of the abutments 22.

Transversely to the displacement direction of the support means 14 and above the same and beneath the supporting frame 11 in its lower operating position (Fig. 11) on either side of this frame are arranged fixed conveyors, expediently conveyor belts 25, extending substantially horizontally, which, in the representations of Fig. 8 and 11 respectively extend at right angles to the plane of the drawing. Attached to one end surface of these conveyor belts 25 are feed devices, not represented here, by which the inner tubular members 45 for the pallet feet 40 may be supplied to the conveyor belts 25. Provided at the points of the two conveyor belts 25 from which such tubular members 45 are to be delivered to the piercing dies 1 arranged on the supporting frame 11 are separating devices in the form of stops 27 and in the

form of piston-cylinder-units 28, and also respective feed slides 29. Also, supply devices 30 which have different axial lengths are secured, so as to be easily detachable, to the side of the conveyor belts 25 or to the frames bearing these conveyor belts which face towards the supporting frame 11. These supply devices 30 respectively consist of a pair of guide rails 31 arranged horizontally and spaced apart from one another and receiving the inner tubular members 45 between them, the ends of these rails, facing away from the conveyor belt 25, being pivotable towards one another in a horizontal plane in the manner of tongs. The ends of the guide rails 31 which are displaceable towards one another in the manner of tongs lie in the displacement path of the piercing dies 1.

So much for the constructional design of the apparatus with which operation now takes place as follows, proceeding from the fact that the structural components which make up the apparatus and which have been described above are located in the relative position to one another shown in Fig. 8.

The prepared outer tubular members 42, five in the present case which is given as an example, are first manually placed on or inserted into the cup-shaped positioning members 16 which are fixed on the plate 15, and then the pallet top 35 is placed on the end surfaces of these tubular members 42, this pallet top 35 being

specifically aligned relative to these tubular members 42 by the stops connected to the uprights 18. On the conveyor belts 25, meanwhile, tubular members 45 have arrived at the separating stations, and tubular members 45 are pushed by the feed slides 29 (Fig. 10) to the ends, acting like tongs, of the guide rails 31 of the supply devices 30, the tubular members now lying in the displacement path of the piercing dies 1 of the supporting frame 11. The sliding carriage 20 (Fig. 8) is now pushed or moved to the left until it is positioned beneath the supporting frame 11 (Fig. 11), whereupon this supporting frame 11 is now lowered by means of the piston-cylinder-unit 10. The piercing dies 1 pass through the tubular members 45 which have been delivered by the supply devices 30 and which now rest against the bearing shoulders 6 of the piercing dies 1, whereupon the cutting edges 4 then cut through the pallet top 35 locally in a star shape and the piercing dies 1 travel into the tubular members 42 until the end surfaces of the two tubular members 42 and 45 thus supplied lie substantially flush with one another (Fig. 13). The individual lugs formed by the star-shaped cuts are clampingly held between the two tubular members 42 and 45. As a result of the pressure exerted by the piercing dies 1, the plate 15 is compressed somewhat against the force of the springs 21, whereupon the plate 15 or the positioning members 16 come to rest against

the abutments 22, 23 and 24 or these abutments cooperate so that the sliding carriage 20 or its guides are virtually free of any load from the applied pressure and only have to absorb the pressure exerted by the springs 21. This pressure is not much greater than the weight of the plate 15 with the positioning members 16, the uprights 18 and the parts 17 and 19 positioned thereon to form the pallet top.

When the pallet top 35 has been cut through in the manner described and the two tubular members 42 and 45 have been inserted one into the other, thereby causing the lugs formed by the cuts to lie clampingly between the two tubular members 42 and 45, the supporting frame 11 with the piercing dies 1 is then retracted and raised into the starting position (Fig. 8) and the sliding carriage 20 is moved back again into its starting position (Fig. 8), and the finished pallet is removed from the support means 14. The feed slides 29 have meanwhile pushed new tubular members 45 into the tong-like end region of the guide rails 31 of the supply device 30, and new tubular members 42 and a new pallet top 35 are now placed on top of the support means 14, and the process described above is now repeated.

The positioning members 16 and the piercing dies 1 are arranged so as to be adjustable on their respective supports in horizontal planes, with the result that pallets with different arrangements and different

numbers of tubular pallet feet can be produced. For this reason supply devices 30 of differing axial length are also provided, and these individual supply devices 30 are secured for easy detachment to the longitudinal sides of the conveyor belts 25. The end, designed like tongs, of the guide rails of these supply devices must of course in each case lie in the displacement path of a piercing die so that when it moves down, the piercing die can pick up a tubular member 45. The supply devices 30 can be thereby adapted to the particular arrangement of the piercing dies 1 on the supporting frame 11.

Fig. 12 shows a plan view of the machine table 7 with the abutments 22 and 23. At the present time two pallets of certain standard sizes are produced and used and the arrangement of the abutments 22 and 23, discernable from this representation of Fig. 12, is selected such that with this arrangement the two standard sizes can be accommodated, but any other distributions of the pallet feet are also conceivable and possible.

Relating to the piercing dies 1, it was stated in connection with the embodiment described that they are cylindrical in shape. It is possible to provide other cross-sectional shapes, polygonal or oval for instance, for these piercing dies and for the pallet feet. While it is also mentioned above that the outer tubular members 42 can be inserted manually into the apparatus,

the insertion of these outer tubular members 42 with an automatically operating mechanism can also be provided.

In order to prevent the inserted pallet top 35 from buckling when the piercing dies 1 move downwards or from being lifted off its support when the piercing dies then move back, a pressing means can be provided for the pallet top. A pressing means of this kind is preferably designed in the shape of a plate. This plate-shaped pressing means is as large as the pallet top and has a number of openings for the piercing dies 1 to pass through.

A plate-shaped pressing means of this kind is mounted in the central region of the apparatus so as to be capable of being lifted and lowered. In its starting position, it is located in the space between the piercing dies 1 and beneath the conveyor belts 5 and above the mounted pallet top 35 (Figure 9). When the sliding carriage 20 with the pallet top 35 placed on top is moved into its operating position, this plate-shaped pressing means is then lowered onto the pallet top 35 and retained there, where it remains until the piercing dies 1 have returned into their upper starting position. For reasons of clarity, however, the plate-shaped pressing means is not represented in the attached Figures which illustrate an embodiment of the invention.

The apparatus shown and described operates with

vertically movable piercing dies 1. It would be conceivable to rotate the apparatus as a whole around 90° so that the piercing dies 1 are moved in the horizontal direction, the pallet top 35 then being moved "upright" into the apparatus.

Key to the Reference Numerals:

| | | | |
|----|----------------------|----|----------------------|
| 1 | Piercing die | 17 | |
| 2 | Portion | 18 | Upright |
| 3 | End surface | 19 | |
| 4 | Cutting edge | 20 | Sliding carriage |
| 5 | Portion | 21 | Spring |
| 6 | Bearing shoulder | 22 | Abutment |
| 7 | Machine table | 23 | Abutment |
| 8 | Frame | 24 | Abutment |
| 9 | Arm | 25 | Conveyor belt |
| 10 | Piston-cylinder-unit | 26 | |
| 11 | Supporting frame | 27 | Stop |
| 12 | Guide rail | 28 | Piston-cylinder-unit |
| 13 | Guide rail | 29 | Feed slide |
| 14 | Support means | 30 | Supply device |
| 15 | Plate | 31 | Guide rail |
| 16 | Positioning member | 32 | |
| | | 35 | Pallet top |
| | | 36 | Pallet runner |
| | | 37 | Bar |
| | | 38 | Dot and dash line |
| | | 39 | Dot and dash line |
| | | 40 | Supporting foot |
| | | 41 | Circle |
| | | 42 | Tubular member |
| | | 43 | Cut |
| | | 44 | Segment |
| | | 45 | Tubular portion |

CLAIMS

1. A pallet, more particularly a flat pallet for piece goods combined to form a loading unit, comprising a pallet top made of a laminar material and supporting feet provided on the pallet top, characterised in that a tubular member is provided as each supporting foot and at the points of the flat pallet top and/or pallet runners, if applicable, which the end surface of the tubular member adjoins, several cuts are provided, arranged crosswise to one another, wherein the free ends of these cuts lie on a line corresponding to the internal contour of the tubular member and, with the segments formed by the cuts folded over, a tubular member is clampingly inserted into the tubular member forming the supporting foot.

2. A pallet according to claim 1, characterised in that tubular portions are inserted at the two end surfaces of the tubular member serving as the supporting foot.

3. A pallet according to claim 1 or 2, characterised in that the axial lengths of the tubular portions belonging to a supporting foot are of equal length.

4. A pallet according to claim 3, characterised in

that the axial length of a tubular portion corresponds to half the length of the tubular member serving as the supporting foot, preferably being somewhat larger than this.

5. A pallet according to claim 1, characterised in that the line joining the free ends of the cuts is formed as an indented or stamped line.

6. A pallet according to claim 1, characterised in that the cross-section of the tubular member or of the tubular portions is circular or at least symmetrical about two axes lying at right angles to one another.

7. A pallet according to claim 4, characterised in that the axial length of a tubular portion is larger, by the thickness of the material of the pallet top or the pallet runner, than half the length of the tubular member.

8. Apparatus for making a pallet having a pallet top and pallet feet formed from tubular members inserted one inside the other, between which tubular members lugs stamped from the pallet top in the manner of a rosette are clamped, producing a press fit, according to one of claims 1 to 7, the apparatus comprising at least one support means for supporting the pallet top and with

positioning members located beneath the support means for arranging the outer tubular members and comprising at least one piercing die, movable into aligned arrangement with one of the positioning members and mounted for axial displacement, with a shaft for holding the inner tubular member forming the pallet foot, the diameter of the shaft corresponding to the internal diameter of the inner tubular member and the length of this shaft being larger than the axial length of the inner tubular member and one of the end edges of the inner tubular member which can be pushed onto the shaft being designed to rest against a shoulder provided on the shaft and preferably formed by an enlargement in the diameter, characterised in that several cutting edges, provided in a star-shaped arrangement and lying on the surface of a hypothetical cone, are arranged on the end surface of the piercing die, and the part of the piercing die having these cutting edges, when the inner tubular member is pushed on to the said piercing die, lying in front of the end surface of the said inner tubular member, and the axis of the cone being aligned with the axis of the shaft.

9. Apparatus according to claim 8, characterised in that several piercing dies having a vertical axis are arranged on a horizontal supporting frame which is adjustable in the vertical direction.

10. Apparatus according to claim 8, characterised in that laterally of the supporting frame, which is adjustable in the vertical direction and carries the piercing dies, there is arranged at least one horizontally-running conveyor, preferably a conveyor belt, with separating devices corresponding to the number of piercing dies arranged on the supporting frame, and provided on the side of the conveyor facing the supporting frame are supply devices by means of which the inner tubular members delivered by the conveyor can be moved into the displacement path of the individual piercing dies.

11. Apparatus according to claim 10, characterised in that conveyors, preferably conveyor belts, are arranged on at least two mutually parallel sides of the vertically adjustable supporting frame, and the separating devices are formed by piston-cylinder-units, the axes of which are at right angles to the conveying direction of the conveyor belt, and each separating device is composed of at least two piston-cylinder-units.

12. Apparatus according to claim 10, characterised in that the supply devices each consist of a pair of guide rails, arranged horizontally and situated at a distance apart, and receiving the inner tubular members between them, the ends of which, facing away from the conveyor,

are pivotable towards one another in a horizontal plane in the manner of tongs.

13. Apparatus according to claim 10 or 12, characterised in that supply devices of differing axial length are provided and the individual supply devices are secured for easy detachment to the longitudinal side of the conveyor.

14. Apparatus according to one of claims 8 to 13, characterised in that provided beneath the vertically adjustable frame is a fixed machine table, on which support means for the pallet top is mounted so as to be displaceable horizontally, and as a result of the horizontal displacement the support means is movable into or outside the area of lift of the supporting frame for the piercing dies.

15. Apparatus according to claim 14, characterised in that the support means has a horizontally-lying frame or a horizontally-lying plate on which cup- or disc-like positioning members are arranged for receiving the outer tubular members, and this frame or plate has stops which position the pallet top placed on the tubular members and these stops lie in a horizontal plane in which are located the upper end surfaces of the outer tubular members which may be placed on top of the positioning

members.

16. Apparatus according to claim 15, characterised in that the frame having the cup- or disc-like positioning members is arranged on a sliding carriage which is movable horizontally relative to the machine table and is elastically supported in the vertical direction with respect to the sliding carriage.

17. Apparatus according to one of claims 8 to 16, characterised in that beneath the positioning members for receiving the outer tubular members, at least when the sliding carriage is moved in beneath the frame carrying the piercing dies, abutments are provided which support the positioning members with respect to the machine table when the vertically-acting applied pressure is exerted by the piercing dies.

18. Apparatus according to claim 17, characterised in that the supporting abutments are designed in multiple parts in the pressure-absorbing, vertical direction.

19. Apparatus according to claim 17, characterised in that the abutments for the positioning members arranged on the edges are designed as one piece and are fixed to the machine table.

20. Apparatus according to claim 17 or 18, characterised in that the abutments for the centrally situated positioning elements are designed in multiple parts, some parts of the abutments being fixed to the machine table and the other parts being fixed to the underside of the centrally situated positioning members.

21. Apparatus according to one of claims 8 to 20, characterised in that the positioning members and the piercing dies may be adjusted in horizontal planes and fixed in position.

22. Apparatus according to one of claims 8 to 20, characterised in that secured to the fixed machine table is a C-shaped or peripherally closed, vertically-upright frame, the guide- and adjustment devices for the frame bearing the piercing dies being arranged on the upper horizontal arm of the said frame.

23. A pallet substantially as hereinbefore described with reference to the accompanying drawings.

24. Apparatus for making a pallet substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977

Examiner's report to the Comptroller under Section 17
(The Search report)

- 24 -

Application number
 GB 9318722.7

Relevant Technical Fields

Search Examiner
 R D CAVILL

- (i) UK Cl (Ed.L) B8H -HQH, -HLC, -HLX, -HQJ, -HRB
 (ii) Int Cl (Ed.5) B65D 19/00, /02, /06, /20, /22, /26, /34, /38, /40

Date of completion of Search
 4 NOVEMBER 1993

Databases (see below)

Documents considered relevant
 following a search in respect of
 Claims :-
 1 TO 24

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES: WPI

Categories of documents

- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.
 Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
 A: Document indicating technological background and/or state of the art. &: Member of the same patent family; corresponding document.

| Category | Identity of document and relevant passages | Relevant to claim(s) |
|----------|---|----------------------|
| X | GB 2163405 A (PACKING) see figures | 1, 3, 5, 6 |
| X | GB 1454173 (VEREINIGTE) see whole document and note die 1 | 1 to 6 |
| X | US 4850284 (PACKING) see in particular Figure 13 | 1 to 7 |
| X | US 4697699 (TOOTSIE) see Figures 6 and 7 | 1, 6 |

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).